love, not egoism, is the motive which the final history of every species justifies." And so on to some beautiful socialistic sentiment and anticipations of "the dominance of a common civic ideal, which to naturalists is known as a Symbiosis." And Prof. Geddes writes tumultuously in the same vein—a kind of pulpit science—many hopeful things of "Renascence," and the "Elixir of Life."

Now there is absolutely no justification for these sweeping assertions, this frantic hopefulness, this attempt to belittle the giants of the Natural Selection period of biological history. There is nothing in Symbiosis or in any other group of phenomena to warrant the statement that the representation of all life as a Struggle for Existence is a libel on Nature. Because some species have abandoned fighting in open order, each family for itself, as some of the larger carnivora do, for a fight in masses after the fashion of the ants, because the fungus fighting its brother fungus has armed itself with an auxiliary alga, because man instead of killing his cattle at sight preserves them against his convenience, and fights with advertisements and legal process instead of with flint instruments, is life therefore any the less a battle-field? Has anything arisen to show that the seed of the unfit need not perish, that a species may wheel into line with new conditions without the generous assistance of Death, that where the life and breeding of every individual in a species is about equally secure, a degenerative process must not inevitably supervene? As a matter of fact Natural Selection grips us more grimly than it ever did, because the doubts thrown upon the inheritance of acquired characteristics have deprived us of our trust in education as a means of redemption for decadent families. In our hearts we all wish that the case was not so, we all hate Death and his handiwork; but the business of science is not to keep up the courage of men, but to tell the truth. And biological science in the study still faces this dilemma, that the individual in a non-combatant species, if such a thing as a non-combatant species ever exist, a species, that is to say, perfectly adapted to static conditions, is, by virtue of its perfect reactions, a mechanism, and that in a species not in a state of equilibrium, a species undergoing modification, a certain painful stress must weigh upon all its imperfectly adapted individuals, and death be busy among the most imperfect. And where your animal is social, the stress is still upon the group of imperfect individuals constituting the imperfect herd or anthill, or what not—they merely suffer by wholesale instead of by retail. In brief, a static species is mechanical, an evolving species suffering—no line of escape from that *impasse* has as yet presented itself. The names of the sculptor who carves out the new forms of life are, and so far as human science goes at present they must ever be, Pain and Death. And the phenomena of degeneration rob one of any confidence that the new forms will be in any case or in a majority of cases "higher" (by any standard except present adaptation to circumstances) than the old.

Messrs. Geddes and Thomson have advanced nothing to weaken these convictions, and their attitude is altogether amazingly unscientific. Mr. Thomson talks of the Gospel of the Resurrection and "that charming girl Proserpina," and Baldur the Beautiful and Dornröschen, and hammers away at the great god Pan, inviting all and sundry to "light the Beltane fires"—apparently with the dry truths of science—"and keep the Floralia," while Prof. Geddes relies chiefly on Proserpine and the Alchemy of Life for his literary effects. Intercalated among these writings are amateurish short stories about spring, "descriptive articles" of the High School Essay type, poetry and illustrations such as we have already dealt with. In this manner is the banner of the "Scots Renascence," and "Bio-optimism" unfurled by these industrious investigators in biology. It will not appeal to science students, but to that large and important class of the community which trims its convictions to its amiable sentiments, it may appear as a very desirable mitigation of the rigour of, what Mr. Buchanan has very aptly called, the Calvinism of science. H. G. WELLS.

THE GLYPTODONT ORIGIN OF MAMMALS.

Studies in the Evolution of Animals. By E. Bonavia, M.D. (London: Constable, 1895.)

IN his preface the author writes that: "Having completed the 'Flora of the Assyrian Monuments and its Outcomes,' I was looking about for something to take up next as a subject of study. In the furriers' windows I was attracted by the leopard and tiger skins, which by degrees became objects of interesting study and speculation." In the true interests of zoology, it is to be deplored that his attention was not attracted by some other subject.

The key-note to the startling theory propounded in this volume is to be found in a sentence on page 131, where it is stated that: "The Glyptodonts, or other armoured animals of a similar nature, were the *originals* from which all existing mammals, including marsupials, descended."

This astounding statement is largely based on the belief that the rosettes on the skins of the jaguar and leopard are the remnants of the rosette-sculpture on the bony carapace of the glyptodonts, the author stating (p. 124) that these markings "are *inherited* from ancestral plate-impressions of some extinct glyptodontoid form, and have *not* been evolved by a process of natural selection."

How the author can conceive that the *Felidæ* are descended from any glyptodont-like form (by which it may be presumed an edentate is meant) will pass the comprehension of any anatomical zoologist; but all will endorse his remark (p. 163) that "one would indeed require to have lived a good bit of time to witness a Glyptodon changing into a Jaguar." This, however, is by no means all. Later on the author finds evidence of glyptodont affinities in the bosses on the skin of Rhinoceroses, and remarks (p. 217) that "the giant armadillo has its hind feet ungulate, its hoofs are almost exactly like those of the Malayan Tapir; and in some rhinoceroses the incisor teeth are wholly wanting, and that part of the jaw is contracted, not unlike that of the Glyptodon." If this means anything, it means that rhinoceroses are evolved from a veritable edentate glyptodont; and it is thus a pity the author did not enlighten us how the full dentition and claws of a jaguar were also to be derived from such a type.

It would be mere waste of space to state how mar-

© 1895 Nature Publishing Group

supials enter the scheme, but it may be mentioned that the loss of the primeval carapace of ordinary mammals is attributed (p. 209) to a deficiency of carbonate of lime in the water and plants on which they subsisted. It will also be a surprise to zoologists to learn (p. 142) that the coloration of the Indian black-buck is due to its having lost its armour on the ventral sooner than on the dorsal surface. And equal wonderment will be experienced when they read (p. 300) that dolphins are near relatives of Plesiosaurs, and that the author doubts whether "there are any good reasons for supposing that Ichthyosaurs were *not* mammals"!

In another chapter the author is led, from the study of monstrosities, to the conclusion that horses are more nearly allied to the Artiodactyla than they are to either rhinoceroses or tapirs!

Many more similar instances might be quoted, but it will suffice to say that if the author be right, all zoologists are hopelessly in the wrong in their views on mammalian affinity.

Among the redeeming features in the book will be found many interesting observations on the coloration of cats and horses, and the author appears to have made out a fairly good case for the derivation of the striping of the tiger from the spots of a leopard-like type. Many of the figures of animals, especially the skins of leopards, are admirable examples of photography, and would be well worth reproduction in other works.

R. LYDEKKER.

OUR BOOK SHELF.

Le Cause Dell' Era Glaciale. By Luigi de Marchi, Libero Docente di Meteorologia nella R. Universita di Pavia. (Pavia: Fratelli Fusi.)

THIS work does not fulfil the expectations raised by its title. It is a prize essay of 220 large octavo pages, divided into three sections. The first treats of the climatic conditions of a glacial invasion, and here the author agrees with a number of German writers whom he quotes, in considering that a glacial epoch is due to a lowering of mean animal temperature and a diminution of the annual range, accompanied by an increased rainfall in summer. The next section treats of the temperature of the air. We find a large collection of empiric formulæ, taken for the most part from German authors, some of which are based on assumptions which appear to be far from satisfactory, and which certainly cannot be verified in the exhaustive way which one would wish before applying them to find the temperature in the Glacial Age. Among these there is one more important than the others, in which t, the mean annual temperature at any given locality, is expressed in terms of no less than *fifteen* physical quantities, such as the supposed temperature of an ideal sky,[1] the absolute radiating power of this sky, the transmissive powers of the atmosphere for radiation from earth and water, and for sun-heat, and last, but not least important, "a term of correction which expresses the effect of the physical and meteorological condition of the locality," and this term may, according to the author, oscillate between −6° C. and +6° C.

The third section, entitled "The Cause of a Glacial Age," contains the author's deductions from this formula. He uses it to disprove the hypothesis that the Ice Age was due to a change in the obliquity, but he cannot apply it to discuss Croll's theory, because it only takes account of the *total* annual heat received. Hence he refers to previous writers for his criticism on Croll. Similarly the geographical hypothesis is dismissed as insufficient, so that the way is cleared for the author's own hypothesis, viz. that the Ice Age was caused by a general lowering of temperature which arose from a diminution of the atmospheric transparency, which can only be explained (p. 183) as the effect of a general diffusion into the atmosphere, over the whole surface of the earth, of a gas, vapour, or dust which absorbs, or reflects towards space, a part of the heat which comes from the sun. "But since the glacial epoch also presupposes an extraordinary rainfall, among the many hypotheses which may be framed, one spontaneously presents itself, viz. that a great mass of aqueous vapour was launched against and diffused into the atmosphere." Owing to the lowering of temperature due to want of transparency, the vapour would fall as snow, and this precipitation would go on until the mass of vapour injected into the atmosphere is entirely or in great part eliminated.

The author quotes an Italian writer, who suggests that the action of volcanos in the age preceding the Ice Ages affords a possible explanation of the (supposed) launching of these vast masses of aqueous vapour into the atmosphere.

Leitfaden für histologische Untersuchungen. By Bernhard Rawitz. Second edition. (Jena: Gustav Fischer, 1895.)

HISTOLOGICAL methods have become so perfected, microscopic appliances so modified, and staining reagents so numerous, that it is necessary to have good reference books for use in laboratories. Although there are a number of such works, amongst which we may mention Lee's "Vade Mecum," Sims Woodhead's "Manual," and Fletcher's edition of Von Kahlden's "Practical Pathological Histology," the appearance of a new edition of Rawitz's compendium will be welcomed by all who were familiar with the first edition, which was published six years ago. It resembles Von Kahlden's book in arrangement, but while this latter has been compiled specially for pathological investigations, Rawitz's "Leitfaden" is essentially intended for the biologist and physiologist, and forms a suitable supplement to its morbid counterpart. When reviewing Dr. Fletcher's translation of Von Kahlden's book, some time back, we regretted the omission of various matters relating to section-cutting, embedding and staining, an omission which is excusable on the ground that in a work on practical pathological histology a sound knowledge of these subjects might be taken for granted. Rawitz gives excellent descriptions of all our recognised modern methods, and a careful account of paraffin embedding and paraffin cutting, which will prove useful to all who wish to become familiar with what is undoubtedly the best method for general histological purposes. His directions for working with celloidin are equally good, and since this method is somewhat neglected in this country the beginner will find a number of hints which Dr. Fletcher might well have included in his translation. The completeness with which the various methods of fixation, hardening, and staining have been enumerated is admirable, and we gain the firm conviction that the author has only included what is sound, and in careful hands certain to give good and trustworthy results. Chapter xi. (part 1) contains some useful information on the art of drawing and "reconstructing" microscopical objects. The "Leitfaden" may be recommended without hesitation to the histologist as a book of reference for use in the laboratory: it will save time, and seldom cause disappointment.

A. A. K.

---

[1] "Not Ferrel's hypothetical temperature of space, but (following Pouillet, Frölich, and Preuter) the temperature of an ideal surface, of which the radiating power is equivalent to that of the whole atmosphere, and of all the celestial bodies, except the sun." This temperature is taken as equal to −45°·4 C. for all parts of the globe, the poles as well as the equator.

© 1895 Nature Publishing Group